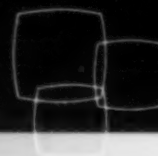




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**DOES FDI ACCELERATE ECONOMIC GROWTH?  
THE OECD EXPERIENCE BASED ON  
PANEL DATA ESTIMATES FOR THE PERIOD 1980-2004**

Madanmohan Ghosh and Weimin Wang,  
Industry Canada

Working Paper 2008-03

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## Abstract

Foreign direct investments (FDI) play an important role as an engine of economic growth. However, although empirical literature offers rich insights on the relationship of FDI and economic growth, it provides mixed evidence on the existence of productivity externalities in the host country generated by foreign multinational companies. A branch of literature suggests that the positive impact of FDI is conditional on countries' stock of human capital or a threshold absorptive capacity.

But, most of the studies that come up with such conclusions are either based on developing or a mix of developing and developed country experiences. There is a dearth of literature explicitly focussed on developed country experiences. Moreover, the literature seems to have focussed only on the impact of inward FDI on host country economic growth. Does outward FDI exert any influence on source country economic growth? This paper addresses both these issues. In a cross-country regression framework using panel time series data from 25 Organisation for Economic Co-operation and Development countries for the period 1980-2004, it finds that both inward and outward FDI are positively correlated with host and source country economic growth. However, the impact of FDI on economic growth is moderate. Results suggest the elasticity of gross domestic product growth with respect to both inward and outward FDI in the host and source countries is about 0.01.

*Key words:* foreign direct investment, economic growth, cross-country panel time series, OECD

## Résumé

L'investissement direct étranger (IDE) joue un important rôle comme moteur de la croissance économique. Cependant, même si les données empiriques donnent de précieux aperçus du lien entre l'IDE et la croissance, elles ne sont pas uniformes quant à l'existence d'effets externes générés par les multinationales étrangères dans le pays hôte. Une partie de la documentation laisse penser que l'effet positif de l'IDE dépend du capital humain des pays et de leur atteinte d'un seuil minimal de capacité d'absorption.

Cependant, la plupart des études qui en viennent à cette conclusion sont fondées sur l'expérience soit de pays en développement, soit d'un mélange de pays en développement et de pays développés. Aucun ouvrage ne concerne explicitement les pays développés. De plus, la documentation semble s'être concentrée seulement sur les effets de l'IDE entrant sur la croissance économique du pays hôte. L'IDE sortant a-t-il une incidence quelconque sur la croissance économique du pays source? L'étude concerne ces deux questions. En utilisant une analyse de régression transnationale portant sur une série chronologique de données de panel provenant de 25 pays de l'Organisation de coopération et de développement économiques entre 1980 et 2004, elle montre que l'IDE entrant et l'IDE sortant sont tous deux positivement corrélés

avec la croissance économique du pays hôte et du pays source. Cependant, les effets de l'IDE sur la croissance sont modérés. Les résultats indiquent que l'élasticité de la croissance du PIB par rapport à l'IDE entrant et sortant dans le pays hôte et le pays source est d'environ 0,01.

*Mots clés : investissement direct étranger, croissance économique, panel transnational de série chronologique, OCDE*

## **1. Introduction**

Foreign direct investments play an important role as an engine of economic growth. Apart from contributing to domestic investments, it enhances the foreign technology absorptive capacity, assists in innovation and technology transfers (including management skills), promotes international trade integration and finally strengthens the competitive environment in a host country. However, although empirical literature offers rich insights on the relationship of FDI and economic growth, it provides mixed evidence on the existence of productivity externalities in the host country generated by foreign multinational companies.<sup>1</sup> Some empirical studies find significant positive effects while others find no independent effect of FDI on host country economic growth. A branch of literature suggests that the positive impact of FDI is conditional on countries stock of human capital or a threshold absorptive capacity. Studies at the industry level also find that for some industries FDI is a positive stimulant to growth for some it is not.

However, most of these studies at the aggregate cross-country level relate to developing or a mix of developing and developed country experiences. Studies explicitly on developed economy experiences are rare. It is important to distinguish between developing and developed country experiences, because contrary to developing world some of the channels such as the technology spillover can work without the threshold absorptive capacity requirements for the developed country, as the developed economies have already reached the threshold level. It is also possible that the channels through which FDI contributes to economic growth are different for the developed economy. At the least, the relative importance of various transmission channels varies between developed and developing economies. It is quite possible that technological spillover is more important for developing economies while the spillover through managerial expertise dominates for the developed economy case.

Another issue is that most of the empirical studies deal with the impact of inward FDI on host country economic growth. Does outward FDI exert any significant influence on source country economic growth? There is a dearth of empirical literature both on the FDI and economic growth in the developed economies and the role of outward FDI in source country economic growth. This study aims to bridge this gap. We study the impact of both inward and outward FDI on economic growth in 25 OECD countries using panel data for the period 1980-2004.

### *Background*

World stock of foreign direct investments has shown almost a 20-fold increase since 1980, surpassing the growth rates of world GDP as well as trade (Figure 1). This phenomenal increase in FDI flows is a reflection of change in attitudes towards FDI. Contrary to the earlier period, the great depression in 1929 until the end of seventies when countries were concerned about the role of FDI in domestic economies, since the 1980s countries are increasingly becoming confident about the positive role of FDI in the economic growth process.

Attracting FDI has become a key part of national development strategies in many economies. At the national level there are efforts not only to reduce entry barriers but also provide special incentives to foreign firms to attract more FDI. UNCTAD (2006) documents 205 policy changes across the world economies in 2005, most of which provide conditions more favourable to foreign companies, to enter and operate in the host economies. The positive attitudes towards FDI and policy changes have resulted in massive increase of FDI globally, during the last 2-3 decades.

Total global stock of inward FDI has increased from about \$570 billion in 1980 to about \$10 trillion in 2004 (Table 1). The growth of FDI flows somewhat slowed down in the early

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<sup>1</sup> See Blomstrom and Kokko (1998), Gorg and Greenway (2004), Lipsey (2002), Barba-Navaretti and Venables (2004), and



1990s but picked up again since mid-1990s. Developed economies hosted about 3/4<sup>th</sup> of global FDI stock, while they have been the source for 88 percent of global FDI stock in 2004. In the first place this implies that, much of the flows of FDI occurred between developed/industrial countries and second, that the developing countries are the net recipient of FDI. As of 2004, the 25 OECD countries in our study hold 71 percent of world stock of FDI and had been the source of 87 percent world stock of FDI.

Table 2 shows that accumulated inward stock of FDI as percentage of GDP in the OECD countries has increased dramatically. While Canada, the US and a few others maintained a trend increase in the stock, countries such as New Zealand and Netherlands have increased the stock of FDI dramatically in the 1990s. Canada's inward FDI stock to GDP ratio increased from 20 percent in 1980 to 31 percent in 2004, but Canada is no longer among the highest in the world. In 1980 its rank was second after Ireland, which fell to 11 among the OECD countries. This also indicates that the distribution FDI stock among the OECD countries during the 1980s and 1990s has also changed significantly. The role of FDI in countries' total capital formation also increased significantly. Globally, inward FDI flows as percentage of gross fixed capital formation increased from a little over 2 percent in the 1980s to a record high in late 1990s to around 15 percent and then declined to about 7 percent (Figure 2).

Given that the importance of FDI has increased during the last 2-3 decades, it is important to understand its role in economic growth. In this paper we empirically examine the role of both inward and outward FDI in 25 OECD countries for the period 1980-2004 using panel data estimates. Our empirical methodology is motivated by the endogenous growth theory in which we include FDI, aggregate expenditure on R&D as additional determinants of economic

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Alfaro and Rodríguez-Clare (1996) for surveys of spillover channels and empirical findings.

growth. We control for other variables such as openness, inflation and the size of the government.

Our analysis suggests significant positive effect of inward FDI on host country economic growth. The coefficient for the growth in outward FDI stock is also positive and significant. This implies that both inward and outward FDI exert significant positive influence in economic growth in the in OECD.

The rest of the paper is organized as follows. In section 2 we discuss the relationship between FDI and economic growth drawing from the literature. In section 3 we describe the data and empirical methodology. Section 4 presents the estimation results and analysis and finally, section 5 summarizes and concludes.

## **2. The relationship of FDI and economic growth: A brief literature review**

Economic intuition suggests that allowing international mobility of capital results in more efficient allocation of world savings. Apart from traditional Ricardian argument of efficiency gains from specialization, in the new growth literature, FDI has also been linked to productivity gains and technology transfers. In addition, several other positive externalities linked to FDI, may have significant impact on economic growth in the host countries. These include the introduction of new processes, managerial skills and know-how in the domestic market, employee training, international network of production, and access to markets.

While FDI may bring substantial gains through the channels describe above, there are a few concerns that it may have to the host economy. FDI can deteriorate the balance of payments position of the host economy through increased imports. It can also crowd out domestic investments. These are not trivial issues and the net impact of FDI on economic growth is therefore and empirical issue.

The role of FDI in the growth process as a diffuser of technology has been supported in the early literature such as Solow (1956). Romer (1993) emphasized the role of FDI in technology diffusion and its link to economic growth. De Mello (1997), in an excellent survey identified two channels through which FDI promotes growth. It does so first, by encouraging the adoption of new technology in the production processes and second by acquisitions of skills and new management practices conducive to growth. See Saggi (2002) for a more recent survey. Grossman and Helpman (1991) provide a comprehensive discussion on the models that links externalities associated with liberal trade policies leading to higher levels of growth.

While there are ample intuitive reasons to believe FDI to have positive economic growth effect on the host countries, the empirical evidence is mixed in case of developing countries. At the macroeconomic level, studies using aggregate FDI flows for a broad cross-section of

countries, generally find a positive role for FDI in generating economic growth especially in particular environments (Carkovic and Levine 2002). These environments among others include achieving threshold level of human capital, income level, a well-functioning capital market and openness to international trade. For example, Borensztein et al. (1998), using a cross-country regression framework find that in order for FDI to have a beneficial impact on growth the country must have attained a sufficiently high level of development, especially as it relates to the accumulation of human capital. In the similar vein, Xu (2000) finds that FDI brings technology and it translates into higher economic growth only when the host country has a minimum threshold level of human capital. Alfaro et al (2004), Durham (2004), and Hermes and Lensink (2003) find that countries with well-developed financial markets gain significantly from FDI in terms of economic growth (Alfaro et al., 2006). However, Khawar (2005) using cross-country data for over two decades finds that, FDI has a significant and positive relationship with real income per capita irrespective of any human capital requirements. Bhagwati (1978) and Balasubramanyam et al (1996) stressed that trade openness is crucial for obtaining the growth effects from FDI. Balasubramanyam, Salisu and Sapsford (1996) using cross-section data for 46 developing countries find that FDI enhances economic growth and this effect is relatively stronger for countries that pursue outwardly oriented trade policy. However, as mentioned earlier these studies are based on data from developing or a mix of developing and developed countries.<sup>2</sup>

On the contrary several micro-economic country or firm-level studies found no evidence of FDI's positive role in economic growth. For example, Aitken and Harrison (1999) found no evidence of technology spillovers running from foreign-owned to domestic-owned firms. Several others including by Germidis (1977), Haddad and Aitken (1993), Mansfield and Romeo (1980)

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<sup>2</sup> Table 3 provides a summary of empirical methodology, time and country coverage and findings.

also fall in this category of studies. Using cross-country data for the period 1981-1999, Alfaro (2003) shows that while total FDI exerts an ambiguous effect on growth, its effect on the primary sector tends to be negative, it is positive in the manufacturing sector and ambiguous in the service sector.

There are plenty of studies comparing productivity in domestic firms and foreign-owned multinationals located in the host country, see for example, Doms and Jensen (1998) for US, Girma et al. (2001) for the UK and Globerman (1994) for Canada. All these studies tend to suggest that foreign firms are more productive compared to equivalent domestic firms. Gera, Gu and Lee (1999) using data for Canada over the period 1973-92 find that one percent increase in inward FDI increases the total factor productivity by 0.16 percent. In a recent study Baldwin, and Gu (2005) suggest that foreign controlled manufacturing plants have higher productivity than domestic controlled plants in Canada. Rao and Tang (2005) suggest that foreign-controlled firms, are on average 10 to 20 percent more productive than domestically controlled firms and they also exert significant positive productivity spills on domestic firms.

### 3. Empirical Methodology and the sources of data

#### *Empirical Methodology*

We use panel data estimation techniques for our empirical analyses. The underline model of our empirical estimation is an extension of the basic growth theory that suggests that alongside domestic capital and labour, FDI, trade and the R&D expenditure are important determinants of growth. In addition, we also consider a couple of macroeconomic and structural variables to control for some of the time variant key characteristics of the economies in the sample. We estimate a cross-country panel time series growth regression model as follows:

$$\Delta y_{i,t} = \mu_i + \beta'X_{i,t} + \gamma'Z_{i,t} + \varepsilon_{i,t} \quad (1)$$

where,  $\Delta y_{i,t}$  is the annual growth rate of real GDP for country  $i$  in year  $t$ .  $\mu_i$  is the country-specific fixed effect.  $X_{i,t}$  is a vector of key independent variables, namely the growth rate of employment ( $\Delta L_{i,t}$ ), investment to GDP ratio ( $I_{i,t}/Y_{i,t}$ ), the growth rate of inward FDI stock ( $\Delta FDI_{i,t}$ ), the growth rate of outward FDI stock ( $\Delta OFDI_{i,t}$ ), the growth rate of openness ( $\Delta OPEN_{i,t}$ ) and the growth rate of expenditure in R&D ( $\Delta GERD_{i,t}$ ). Ideally we should have used growth rate capital stock instead investment to GDP ratio. But in view of the formidable problem associated with the measurement of capital stock, we use the gross capital formation to GDP ratio, instead of the growth rate of capital stock, as an explanatory variable to growth as is done in the vast empirical literature.<sup>3</sup> The control variables are the rate of inflation ( $INFL_{i,t}$ ) and the government final consumption expenditure to GDP ( $GOV\_EXP_{i,t}$ ) ratio. Thus the equation in expanded form is given by:

$$\Delta y_{i,t} = \mu_i + \beta_1 \Delta L_{i,t} + \beta_2 (I_{i,t}/Y_{i,t}) + \beta_3 \Delta FDI_{i,t} + \beta_4 \Delta OFDI_{i,t} + \beta_5 \Delta OPEN_{i,t} + \beta_6 \Delta GERD_{i,t} + \gamma_1 INFL_{i,t} + \gamma_2 GOV\_EXP_{i,t} + \varepsilon_{i,t} \quad (2)$$

Barro (1991), Carkovic and Levine (2002) and Alfaro (2003), to name a few have used time invariant initial conditions, such as the initial GDP, as an important determinant of growth. However, our choice of country-specific fixed effect (as done by Nath (2005) for example) model has been mainly for 2 reasons. First, countries in our sample belong to somewhat similar level of economic development and therefore, country-specific factor may be more important for variations in economic growth experience across the countries while initial condition might not be that important. It is also dictated by a desire for parsimonious specification and a concern for omitted variable problem. Country-specific fixed effects will capture some of the key differences in economic or political institutions across the countries in the sample. However, we also run regressions with initial GDP as an independent variable to address the issues of convergences.

#### *Data*

Data for 25 OECD countries on relevant economic variables for the period 1980-2004 are obtained from the United Nations Conference on Trade and Development (UNCTAD), OECD and the Worldbank's World Development Indicators Database. Selected OECD countries are those for which the longest data series are available. There are however, some missing data points in some of our sample countries. We use extrapolation or interpolation to fill the missing data points.

Annual data on the stock of inward FDI in US dollars at current prices are obtained from the UNCTAD. These are then converted into constant prices using implicit GDP deflator. Data on GDP, aggregate employment, gross capital formation, government consumption expenditures, inflation rate, exports and imports of goods and services are obtained from world development indicators' database of the Worldbank. Annual data on gross expenditure on research and

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<sup>1</sup> Recently OECD has estimated capital stock for some of the countries but the series is not long enough and it does not cover all of the sample countries in our model.

developments for the sample countries for the period 1980-2004 at constant purchasing power parity (PPP) adjusted prices are obtained from OECD MSTI database.

Using the data obtained from various sources we constructed the following variables for our regression analysis. First, the dependent variable, economic growth, is calculated as first log difference of real GDP. Employment growth is calculated as the first log difference of annual aggregate employment. FDI growth is computed as the first log difference of FDI stock. Trade openness is calculated as a ratio of the sum of aggregate exports and imports to GDP- all in current prices. Growth in GERD is computed as the first log difference of the annual GERD at constant prices. Appendix 1 provides the basic statistic, such as the mean, median and standard deviation for all the data series. Appendix 2 presents the correlations among the variables, which has been used in choosing independent variables. Figure 3 displays the growth rates of GDP, inward FDI stock and openness for each of the sample countries.



#### 4. Empirical Results

Regression results from alternative model specifications and estimation techniques are presented in Table 4. Due to data quality issues the period covered in the regressions is 1983-2004 and the number of countries selected is 24. Results from 9 sets of regressions using feasible GLS estimation with cross-country weights are reported. Columns (1) to (6) use time-invariant initial GDP, while columns (7) to (9) are results from country-specific fixed effect models. Note that standard errors are estimated using Whites heteroskedasticity consistent variance-covariance estimates that are robust to general heteroskedasticity. Residuals are required to be normally distributed for least squares estimators to be efficient. We did a normality test for all the regressions in the tables using Jarque-Bera statistics that is distributed as  $\chi^2$  with two degrees of freedom under the null hypothesis of a normal distribution.

As can be seen that model estimation (i.e., columns (1) to (6)) with time invariant initial condition, does not yield efficient estimation results and the coefficient for initial GDP is not significant in any of these equations. The test results suggest that residuals in the model specifications with cross-country fixed effect models (i.e. columns (7) to (9)) are normally distributed<sup>4</sup>. So we mainly focus on results from cross-country fixed effect models. Data suggests high degree of correlation between the growth rates of inward and outward FDI stocks. We therefore run 3 regressions using cross-country fixed effect models. Regression equation (7) excludes the outward FDI (includes the inward FDI), while equation (8) excludes the inward FDI but includes the outward FDI along with other variables. In equation (9) both inward and outward FDI are included. In Figures 4 and 5 we plot the actual and fitted and actual growth rate of GDP, respectively for the whole sample and Canada separately from regression 7 in Table 4.

<sup>4</sup> A model is claimed to pass the normality test when the p-value of the Jarque-Bera statistics for its residuals is greater than 0.1, which means that the null hypothesis of a normal distribution cannot be rejected at 10% level of significance.

As expected in all regressions the coefficients for employment growth and investment to GDP ratio are positive and highly significant. Among the variables of interest, the growth of inward FDI has significant and positive impact on GDP growth except equation (9). We can ignore results from equation (9) due multi-collinearity problems between the growth rates of inward and outward FDI. The value of the coefficient for the growth of inward FDI is around 0.01. This implies that one percent increase in the growth in the inward stock of FDI results in 0.01 percent growth in GDP. The coefficient for the growth of outward FDI is also positive and statistically significant and its estimated value is around 0.01.

The effect of inflation and government expenditure on GDP growth is negative and highly significant. This result is consistent with other empirical findings e.g., Borensztein et al. (1998). We also tried using the product of FDI growth and the growth of GERD as an additional explanatory variable to check whether these two variables jointly can affect GDP growth. The quality of the results did not change and the interaction term is not statistically significant. Also the regression does not pass the residual test. Given that the sample countries are somewhat in the similar level of economic development in terms of the absorptive capacity it seems that it is not an issue for the developed economy.

## 5. Summary and conclusions

In this paper we study the impact of both inward and outward FDI on economic growth in the OECD countries using panel data estimation for the period 1980-2004. The main findings of our study are that both inward and outward FDI positively contribute to economic growth in the OECD. However, the impact of FDI in economic growth is moderate. Coefficients for all other variables in the cross-country regression model have the expected signs. Recent studies (e.g., Golub (2003) and Golub et al. (2003), Ghosh and Wang (2007)) suggest tremendous potential for growth in the flows of FDI across OECD countries through reduction of barriers. Our regression results indicate that the implications for economic growth from these are however moderate.

Contrary to earlier findings, essentially on developing countries, that the positive impact of FDI is conditional on countries' stock of human capital or a threshold absorptive capacity, our results from OECD data find that FDI exert positive influence on both host and source country economic growth irrespective of any threshold requirements. This is not surprising as our sample only includes the developed economies which have already reached a threshold level of human capital stock or the level of R&D.

One possible future work in this area would be to examine the relative importance of various channels through which FDI influence economic growth in the developing versus the developed economies.

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**Table 1: FDI Facts**

	Value (billion dollars)					Annual Growth			
	1980	1990	1995	2000	2004	1980-1990	1990-1995	1995-2000	2000-2004
<b>Inward FDI Stock</b>									
Developed economies	398 (75)	1404 (79)	2056 (74)	3976 (69)	6470 (73)	13.4	7.9	14.1	12.9
Developing economies	132 (25)	364 (21)	698 (25)	1740 (30)	2233 (25)	10.7	13.9	20.1	6.4
25 OECD countries	407 (77)	1436 (81)	2084 (75)	4007 (69)	6297 (71)	13.5	7.7	14.0	12.0
World	530	1769	2763	5786	8902	12.8	9.3	15.9	11.4
<b>Outward FDI Stock</b>									
Developed economies	496 (87)	1638 (92)	2606 (89)	5257 (86)	8610 (88)	12.7	9.7	15.1	13.1
Developing economies	74 (13)	147 (8)	335 (11)	869 (14)	1036 (11)	7.1	17.8	21.0	4.5
25 OECD countries	512 (90)	1640 (92)	2614 (89)	5281 (86)	8461 (87)	12.4	9.8	15.1	12.5
World	570	1785	2942	6148	9732	12.1	10.5	15.9	12.2

**Note:** Figures in parenthesis are world share of the respective regions.

**Table 2: Inward FDI Stock as a percentage of GDP**

	1980	1985	1990	1995	2000	2004
Australia	7.9	14.4	23.7	28.0	28.7	39.8
Austria	3.9	5.2	6.7	8.2	15.7	21.4
Belgium*	6.0	22.3	29.6	40.8	85.5	73.5
Canada	20.4	18.4	19.7	21.2	29.8	31.1
Denmark	6.1	6.0	6.9	13.2	46.5	40.7
Finland	1.0	2.5	3.7	6.5	20.2	30.1
France	3.9	6.7	7.0	12.2	19.6	26.2
Germany	4.0	5.3	6.5	6.6	14.3	12.7
Greece	9.3	20.2	6.8	9.3	12.6	13.3
Iceland	0.0	2.5	2.4	1.9	5.8	14.8
Ireland	189.4	198.1	88.9	72.8	133.8	126.2
Italy	2.0	4.5	5.4	6.0	11.3	13.2
Japan	0.3	0.3	0.3	0.6	1.1	2.1
Korea, Republic of	2.1	2.2	2.0	1.8	7.3	8.1
Mexico	0.0	4.7	8.5	14.3	16.7	27.0
Netherlands	10.8	18.7	23.3	28.0	65.8	74.1
New Zealand	10.3	8.9	18.2	42.3	53.9	50.5
Norway	10.3	11.7	10.7	12.7	18.1	20.4
Portugal	12.3	18.7	14.8	17.7	27.0	38.9
Spain	2.3	5.0	12.5	17.8	26.7	33.3
Sweden	2.2	4.1	5.3	12.5	39.2	47.0
Switzerland	7.8	10.2	14.5	18.1	35.3	50.6
Turkey	12.5	13.8	7.4	8.8	9.6	11.6
United Kingdom	11.8	14.1	20.6	17.6	30.5	36.3
United States	3.0	4.4	6.9	7.3	12.9	12.6

**Source:** Inward FDI stock data from UNCTAD and GDP data from Worldbank WDI database.

**Table 3: Studies on FDI and productivity growth (incomplete)**

Authors	Methodology	Coverage	Time period	Results
Balasubramanyam et. al (1996)	OLS	46 countries	1970-85	positive
Baldwin, John and Wulong Gu (2005)				
Borensztein et al. (1998)		69 developing countries	Two decades 1970-79 1980-89	Positive subject to minimum threshold stock of human capital.
Blomström, M. and A. Kokko (1998)				
Busse and Groizard (2006)				
Carkovic and Levine (2002)	GMM	72 countries	1960-1995	No robust independent effect
Chakraborty and Nunnenkamp (2006)				
Ghosh Ray and Van den Berg (2006)		United States		Significant positive effect on US economic growth
Chowdhury and George (2006)				
De Mello (1997)				
Doms and Jensen (1998)				
Gera, Gu and Lee (1999)		Canada	1972-1992	Significant positive
Girma, Greenaway and Wakelin (2001)				
Globerman, Ries and Vertinsky (1994)				
Hansen, Henrik and Rand (2004)	Granger-casual relationship between FDI and GDP	31 developing countries	1970-2000	Bi-directional causality between FDI/GDP ratio and the level of GDP. FDI have a lasting impact on the level of GDP, while GDP has no long run impact on FDI/GDP ratio
Alfaro (2003)	OLS	47 countries (3 sectors)	1981-1999	Ambiguous
Rao, and Tang (2005)				
Townsend, Isaac (2003).				



**Table 4: Regression Results for GDP Growth: Panel Estimates**  
 Dependent Variable: Annual growth of GDP: 1983-2004  
 (White diagonal standard errors & Covariance (d.f. corrected))

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Initial GDP	0.0004 (0.3588)	0.0005 (0.2653)	0.0005 (0.2853)	0.0004 (0.3971)	0.0005 (0.2713)	0.0005 (0.3202)	-	-	-
Constant	-	-	-	-	-	-	0.0691 (0.0000)	0.0691 (0.0000)	0.0682 (0.0000)
Growth in inward FDI stock	0.0164 (0.0002)	-	0.0126 (0.0093)	0.0117 (0.0003)	-	0.0076 (0.0594)	0.0104 (0.0009)	-	0.0058 (0.1362)
Growth in outward FDI stock	-	0.0133 (0.0016)	0.0068 (0.1062)	-	0.0124 (0.0009)	0.0073 (0.0933)	-	0.0125 (0.0006)	0.0082 (0.0576)
Employment growth	0.2815 (0.0000)	0.2757 (0.0000)	0.2754 (0.0000)	0.2769 (0.0000)	0.2750 (0.0000)	0.2721 (0.0000)	0.2731 (0.0000)	0.2657 (0.0000)	0.2669 (0.0000)
Gross capital formation - to - GDP ratio	0.0747 (0.0001)	0.0628 (0.0005)	0.0672 (0.0003)	0.0745 (0.0001)	0.0632 (0.0006)	0.0660 (0.0004)	0.0632 (0.0003)	0.0550 (0.0008)	0.0561 (0.0008)
Growth in Openness	0.1011 (0.0000)	0.0963 (0.0000)	0.1029 (0.0000)	0.1021 (0.0000)	0.0974 (0.0000)	0.1036 (0.0000)	0.1057 (0.0000)	0.1047 (0.0000)	0.1090 (0.0000)
Growth in GERD	0.0818 (0.0000)	0.0786 (0.0000)	0.0837 (0.0000)	0.0669 (0.0000)	0.0745 (0.0000)	0.0704 (0.0000)	0.0595 (0.0001)	0.0673 (0.0000)	0.0629 (0.0001)
Inflation	-0.0004 (0.0112)	-0.0004 (0.0208)	-0.0004 (0.0155)	-0.0004 (0.0066)	-0.0004 (0.0141)	-0.0004 (0.0104)	-0.0006 (0.0005)	-0.0005 (0.0016)	-0.0005 (0.0011)
Government Expenditure to GDP ratio	-0.0161 (0.4251)	-0.0112 (0.5504)	-0.0167 (0.3962)	-0.0109 (0.5818)	-0.0102 (0.5857)	-0.0109 (0.5702)	-0.0102 (0.0000)	-0.0109 (0.0000)	-0.0102 (0.0000)
Growth in inward FDI * Growth in GERD	-0.1029 (0.0642)	-0.0260 (0.5792)	-0.1019 (0.0678)	-	-	-	-	-	-
AR(1)	0.3676 (0.0000)	0.3373 (0.0000)	0.3598 (0.0000)	0.3620 (0.0000)	0.3387 (0.0000)	0.3523 (0.0000)	0.2231 (0.0000)	0.1992 (0.0002)	0.2094 (0.0001)
Country fixed effect	-	-	-	-	-	-	Yes	Yes	Yes
Cross-country weights	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No of cross-sections used	24	24	24	24	24	24	24	24	24
Total panel (unbalanced) observations	518	518	518	518	518	518	518	518	518
Normality Test	Pass (0.1479)	No (0.0723)	Pass (0.1722)	No (0.0736)	No (0.0783)	No (0.0191)	Pass (0.1545)	Pass (0.1117)	Pass (0.1596)
Durbin-Watson Statistics	2.0089	1.9969	2.0070	2.0139	2.0039	2.0109	1.9693	1.9586	1.9633
Adjusted R-squared	0.4379	0.4285	0.4360	0.4367	0.4305	0.4340	0.5285	0.5293	0.5298

Note: Figures in parenthesis are p-ratios.

**Table 4: Regression Results for GDP Growth: Panel Estimates**

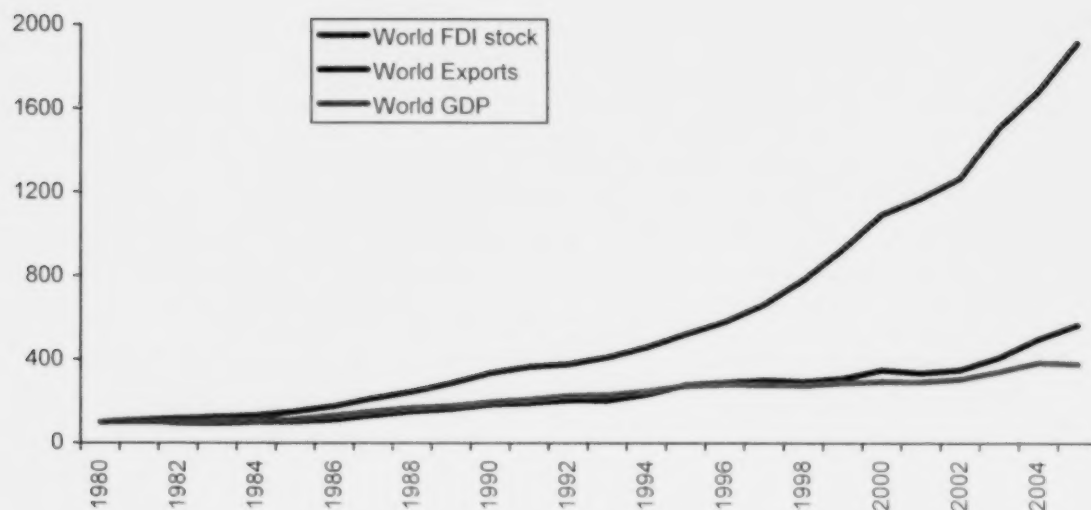
Dependent Variable: Annual growth of GDP: 1983-2004

(White diagonal standard errors &amp; Covariance (d.f. corrected))

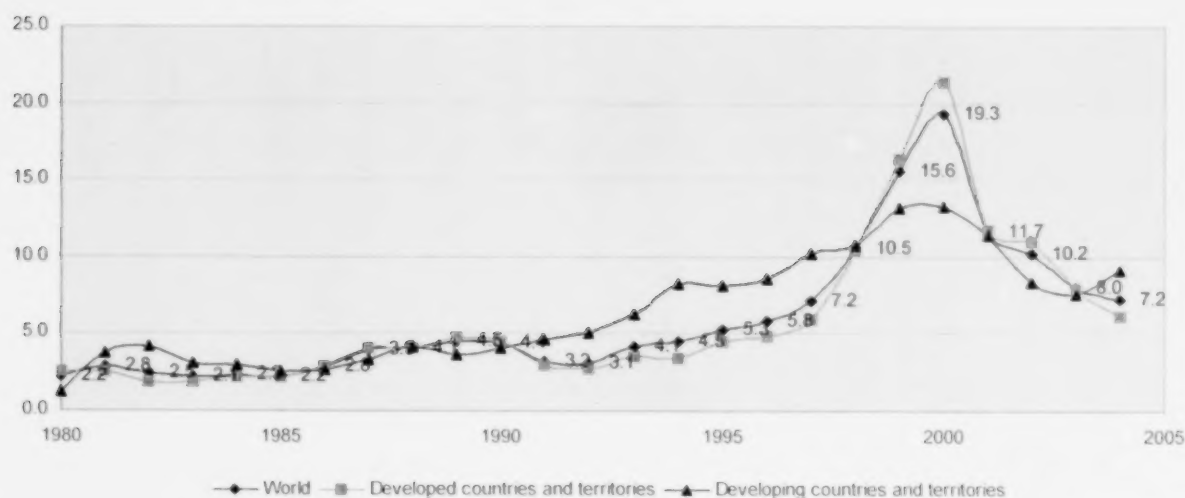
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Initial GDP	0.0004 (0.3588)	0.0005 (0.2653)	0.0005 (0.2853)	0.0004 (0.3971)	0.0005 (0.2713)	0.0005 (0.3202)	-	-	-
Constant	-	-	-	-	-	-	0.0691 (0.0000)	0.0691 (0.0000)	0.0682 (0.0000)
Growth in inward FDI stock	0.0164 (0.0002)	-	0.0126 (0.0093)	0.0117 (0.0003)	-	0.0076 (0.0594)	0.0104 (0.0009)	-	0.0058 (0.1362)
Growth in outward FDI stock	-	0.0133 (0.0016)	0.0068 (0.1062)	-	0.0124 (0.0009)	0.0073 (0.0933)	-	0.0125 (0.0006)	0.0082 (0.0576)
Employment growth	0.2815 (0.0000)	0.2757 (0.0000)	0.2754 (0.0000)	0.2769 (0.0000)	0.2750 (0.0000)	0.2721 (0.0000)	0.2731 (0.0000)	0.2657 (0.0000)	0.2669 (0.0000)
Gross capital formation to - GDP ratio	0.0747 (0.0001)	0.0628 (0.0005)	0.0672 (0.0003)	0.0745 (0.0001)	0.0632 (0.0006)	0.0660 (0.0004)	0.0632 (0.0003)	0.0550 (0.0008)	0.0561 (0.0008)
Growth in Openness	0.1011 (0.0000)	0.0963 (0.0000)	0.1029 (0.0000)	0.1021 (0.0000)	0.0974 (0.0000)	0.1036 (0.0000)	0.1057 (0.0000)	0.1047 (0.0000)	0.1090 (0.0000)
Growth in GERD	0.0818 (0.0000)	0.0786 (0.0000)	0.0837 (0.0000)	0.0669 (0.0000)	0.0745 (0.0000)	0.0704 (0.0000)	0.0595 (0.0001)	0.0673 (0.0000)	0.0629 (0.0001)
Inflation	-0.0004 (0.0112)	-0.0004 (0.0208)	-0.0004 (0.0155)	-0.0004 (0.0066)	-0.0004 (0.0141)	-0.0004 (0.0104)	-0.0006 (0.0005)	-0.0005 (0.0016)	-0.0005 (0.0011)
Government Expenditure to GDP ratio	-0.0161 (0.4251)	-0.0112 (0.5504)	-0.0167 (0.3962)	-0.0109 (0.5818)	-0.0102 (0.5857)	-0.0109 (0.5702)	<b>-0.3027</b> (0.0000)	<b>-0.3009</b> (0.0000)	<b>-0.2968</b> (0.0000)
Growth in inward FDI * Growth in GERD	<b>-0.1029</b> (0.0642)	<b>-0.0260</b> (0.5792)	<b>-0.1019</b> (0.0678)	-	-	-	-	-	-
AR(1)	0.3676 (0.0000)	0.3373 (0.0000)	0.3598 (0.0000)	0.3620 (0.0000)	0.3387 (0.0000)	0.3523 (0.0000)	0.2231 (0.0000)	0.1992 (0.0002)	0.2094 (0.0001)
Country fixed effect	-	-	-	-	-	-	Yes	Yes	Yes
Cross-country weights	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No of cross-sections used	24	24	24	24	24	24	24	24	24
Total panel (unbalanced) observations	518	518	518	518	518	518	518	518	518
Normality Test	Pass (0.1479)	No (0.0723)	Pass (0.1722)	No (0.0736)	No (0.0783)	No (0.0191)	Pass (0.1545)	Pass (0.1117)	Pass (0.1596)
Durbin-Watson Statistics	2.0089	1.9969	2.0070	2.0139	2.0039	2.0109	1.9693	1.9586	1.9633
Adjusted R-squared	0.4379	0.4285	0.4360	0.4367	0.4305	0.4340	0.5285	0.5293	0.5298

Note: Figures in parenthesis are p-ratios.

**Figure 1: World GDP, exports and FDI stock (index, 1980= 100)**

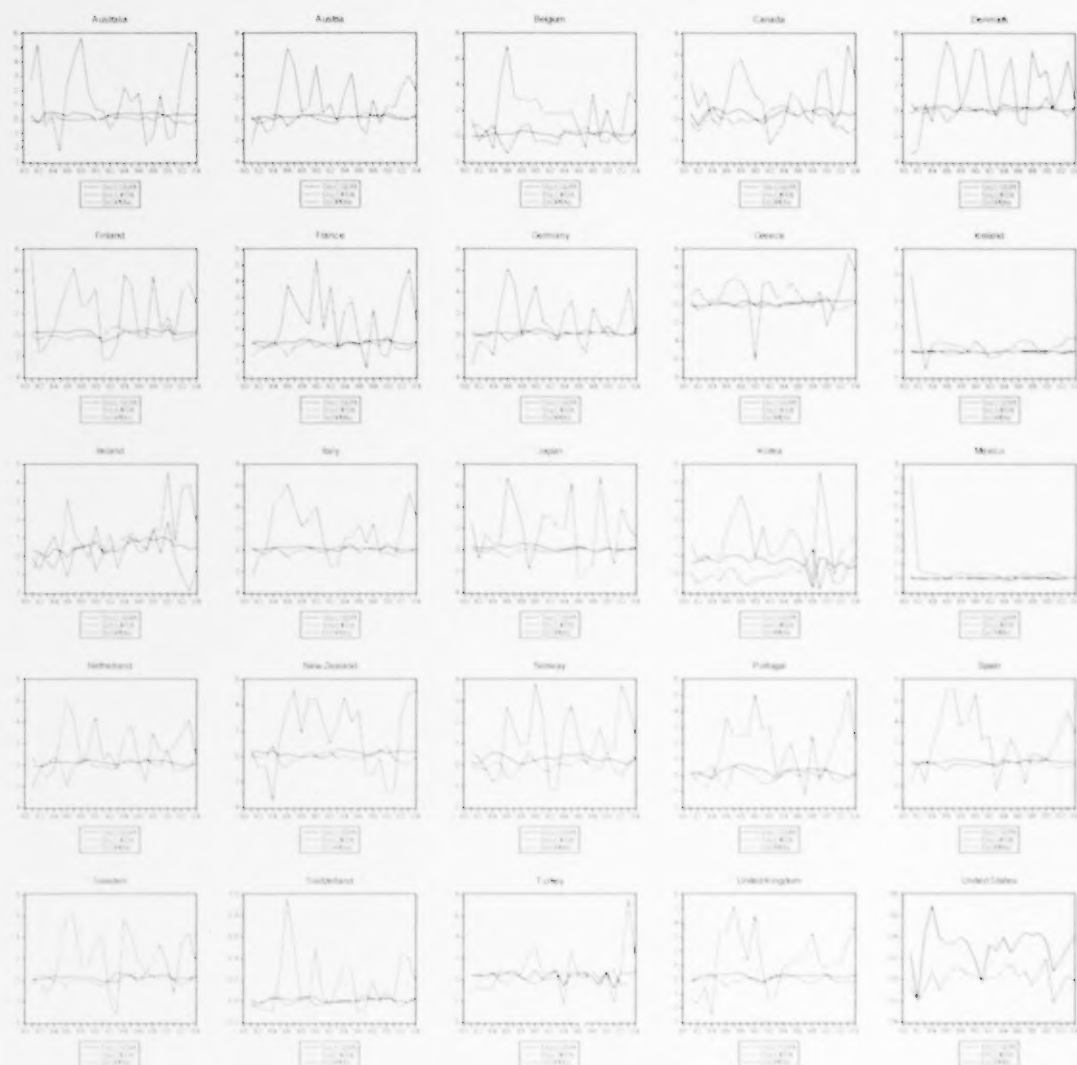


**Figure 2: Inward FDI Flows as % of Gross Fixed Capital Formation**

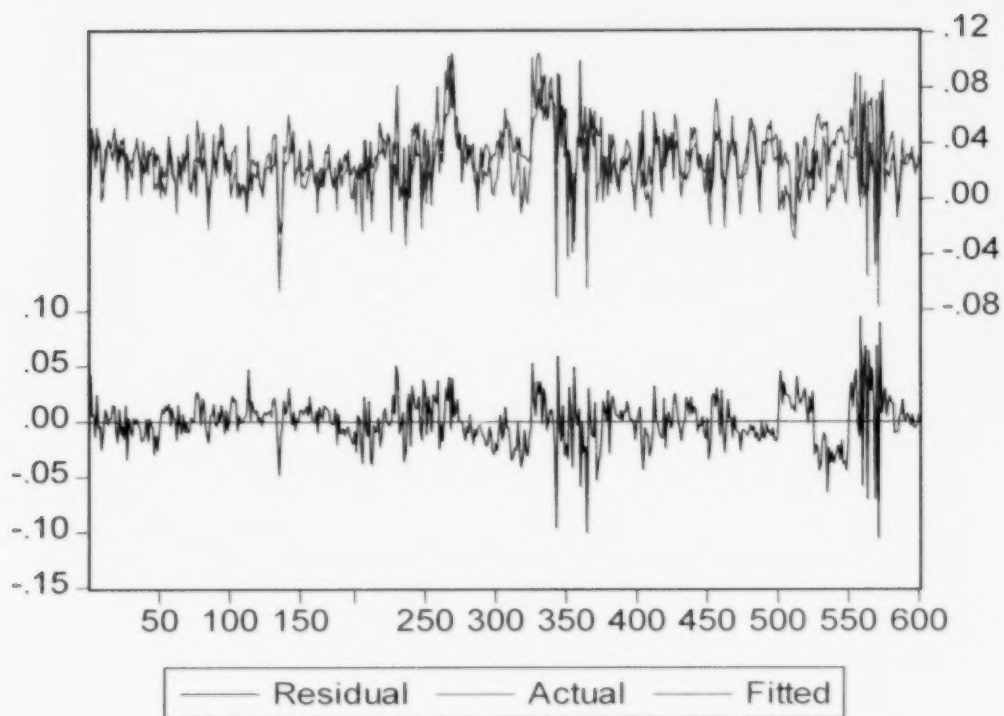


Source: UNCTAD

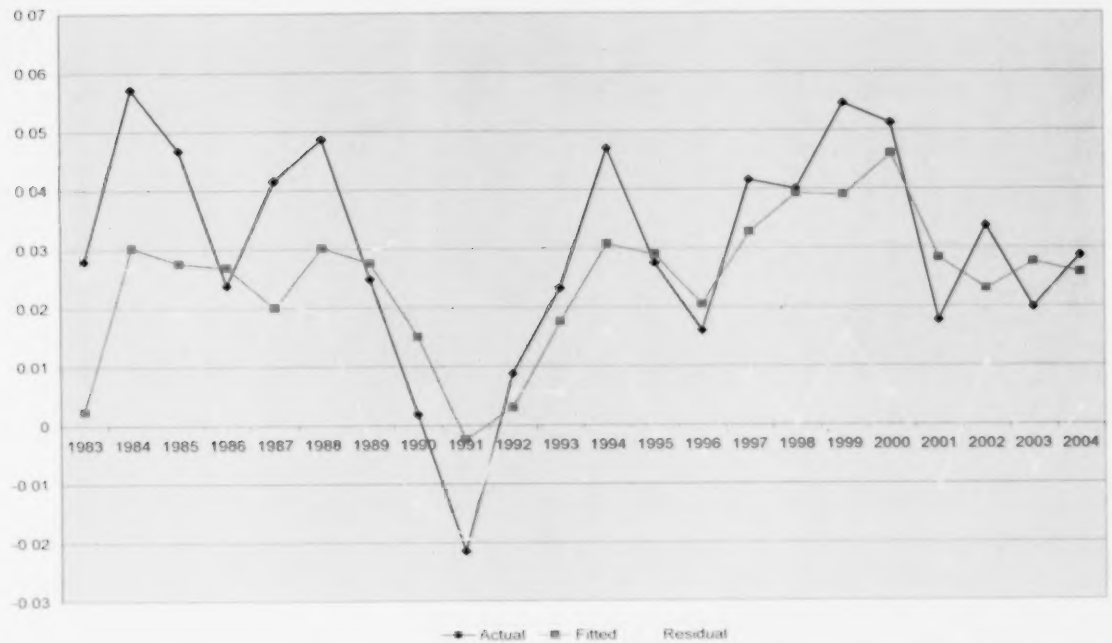
**Figure 3: Annual rates of growth of GDP, inward FDI stocks and openness in sample countries**



**Figure 4: Actual, fitted and residuals of GDP growth rate from  
estimated equation (7) Table 4**



**Figure 5: Actual, fitted and residuals of GDP growth rates from estimated equation (7) Table 4: Canada**



### Appendix 1: Series Statistics

	Mean	Median	Maximum	Minimum	Std. Dev.
D(LCGDP)	0.0271	0.0275	0.1053	-0.0779	0.0251
D(LCIFDI)	0.1767	0.1345	7.1559	-0.6557	0.3868
D(LCOFDI)	0.1853	0.1627	1.0067	-0.5162	0.2203
D(LEMP)	0.0113	0.0095	0.2426	-0.0730	0.0247
SGCF/SCGDP	0.2182	0.2101	0.7050	0.1209	0.0542
SINFL	9.0353	3.4983	131.8267	-0.9151	16.4059
SGFCE/SCGDP	0.1950	0.1940	0.3304	0.1001	0.0469
OPEN	0.6345	0.6001	1.8224	0.1599	0.2987
D(LGRD)	0.0498	0.0460	0.4968	-0.3440	0.0566

**Note:**

D(LCGDP) = Growth rate of GDP

D(LCIFDI) = Growth rate of inward FDI stock

D(LCOFDI) = Growth rate of outward FDI stock

D(LEMP) = Growth rate of employment

SGCF/SCGDP = Gross capital formation to GDP ratio

SINFL = Inflation, consumer prices

SGFCE/SCGDP = General government final consumption expenditure to GDP ratio

OPEN = openness

D(LGRD) = Growth rate of gross expenditure on R & D

### Appendix 2: Correlation Table

	D(LCGD P)	D(LCIFD I)	D(LCOFD I)	D(LEM P)	SGCF/ SCGD P	SINF L	SGFC E/ SCGD P	OPE N	SGRD /SCGD P
D(LCGDP)	1.00	0.17	0.26	0.41	0.27	-0.07	-0.23	0.11	0.06
D(LCIFDI)	0.17	1.00	0.47	0.12	0.13	0.04	-0.07	-0.06	-0.06
D(LCOFDI)	0.26	0.47	1.00	0.20	0.21	-0.10	-0.05	-0.04	0.03
D(LEMP)	0.41	0.12	0.20	1.00	0.14	0.06	-0.24	0.07	-0.10
SGCF/SCGDP	0.27	0.13	0.21	0.14	1.00	-0.09	-0.33	-0.14	0.04
SINFL	-0.07	0.04	-0.10	0.06	-0.09	1.00	-0.31	-0.23	-0.42
SGFCE/SCGD P	-0.23	-0.07	-0.05	-0.24	-0.33	-0.31	1.00	0.25	0.27
OPEN	0.11	-0.06	-0.04	0.07	-0.14	-0.23	0.25	1.00	0.15
D(LGRD)	0.24	0.03	0.07	0.21	0.09	0.03	-0.04	0.00	-0.12

**Note:** See Appendix 1





